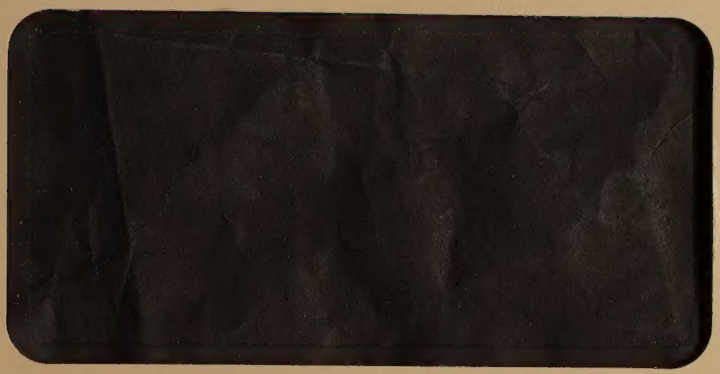
*Measurements International*



# OPERATING MANUAL

## MODEL 4220A
## FOUR TERMINAL MATRIX SCANNER

*Measurements International*

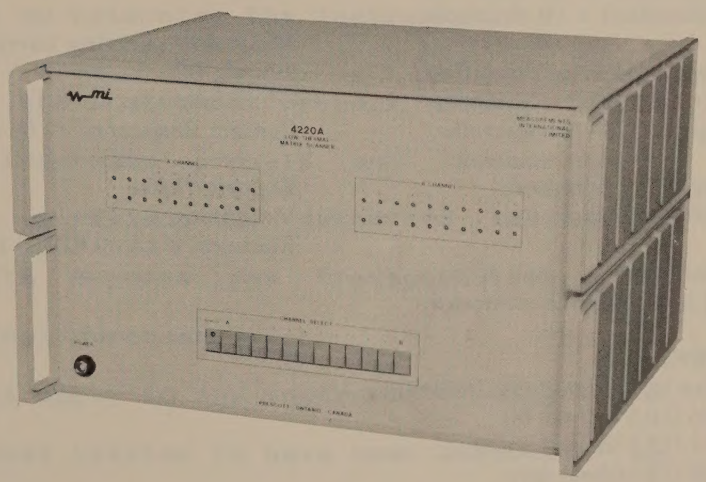
# PRODUCT BULLETIN

# Laboratory Matrix Scanner

MODEL 4220A

**FEATURES**

- True four terminal Matrix Scanner.
- 20-four terminal inputs. 40-two terminal inputs.
- Front panel or bus operation.
- Thermals in the nanovolt region.




**APPLICATIONS**

- Resistance calibrations.
- Thermometry scanner.
- Low thermal voltage measurement.

## LOW THERMAL DESIGN

Measurements International's Model 4220A utilizes ultra-sensitive high efficiency polarized relay technology to deliver an automated low thermal matrix scanner. The relays used are 2 coil latching type, requiring only a short millisecond pulse to activate to eliminate self heating in the relay. The relay boards are thermally isolated to maintain thermal equilibrium in the switching area.

The Model 4220A has a total of 80 inputs and 8 outputs. For resistor applications it will handle up to 20 four terminal resistors and 40 two terminal connections for voltage applications. Connections to the resistors and measuring apparatus are made at the back of the scanner. Provisions have also been made for connecting the shields of the resistors.

## OPERATION

The Model 4220A provides an easy means for intercomparing resistors, standard cells or 10 volt references. The relays selecting the rear panel input terminals are activated by front panel pushbuttons or by commands sent over the IEEE-488 interface bus. The rear panel inputs are selected by pressing the channel desired and then the A or B button. The corresponding LED will be illuminated.

Several protection circuits are built into the 4220A. The corresponding LED is driven directly from a separate contact on the relay. Only one set of relays can be activated at any one time. It is necessary to open the closed set before another can be activated on the same side.

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## SPECIFICATIONS

**Number of Inputs:**
Model 4220A

2-Terminal = 40 channels.
4-Terminal = 20 channels.

Model 4210A

2-Terminal = 20 channels.
4-Terminal = 10 channels.

**Thermoelectric Potentials:**
<100 nanovolts maximum
typically 50-70 nanovolts.

**Error Contribution:**
<20 nanovolts

**Bus Input:**
24 pin IEEE-488 connector.

**GENERAL:**
**Size in Millimeters (inches):**
266 (10.5 inches) high,
451 (17.7 inches) wide,
306 (12 inches) deep.
(Model 4210A - 133 (5 inches high.)

**Relay Contact Rating:**
Maximum switching Power
60W, 125 VA

Maximum switching Voltage
220 V DC, 250 V AC

Maximum switching current
2 A AC, DC

Maximum carrying current
2 A AC, DC

Contact Resistance <0.02 ohms

**Expected Life:**
Mechanical $5 \times 10^7$
Electrical @ 1A 30 VDC $5 \times 10^5$

**Power:**
115/230 V +/- 10% 50/60 Hz

**Rear Panel Connections:**
Low thermal tellurium copper MIL binding posts.

**Switch Outputs:**
Low thermal tellurium copper
MIL binding posts.

**Display:**
Two LED displays indicating open circuit (flashing) and input select (solid) on both A and B inputs.

**Control:**
Front panel local control. IEEE-488 remote control.

---

## HOW TO ORDER

| | |
|---|---|
| 4220A | LABORATORY MATRIX SCANNER |

Measurements International Limited
P.O. Box 2359, Prescott, Ontario K0E 1T0 Tel.:(613) 925-5934 Fax: (613) 925-1195

Data subject to change.

*Measurements International*

Printed in Canada

Limited Warranty:

All instruments sold by Measurements International Limited are warranted to the original purchaser against defects in materials and workmanship from the date of original shipment from the factory for a period of one year unless otherwise specified under extended warranty.

Model#_____ S/N _____

EXTENDED WARRANTY _____ YES _____ NO

During the warranty period Measurements International will, at it's option, either repair or replace products which prove to be defective. Warranty service or repair must be performed at the factory. The purchaser must notify Measurements International Limited prior to returning the instrument.

The buyer shall return the instrument properly packaged and with transportation and insurance prepaid and Measurements International shall repair or replace the defective instrument without charge and at its expense pay transportation and insurance back to the original purchaser.

This warranty does not apply to any instruments determined by Measurements International Limited to have been subjected to customer alteration, modification, negligence or misuse.

EXCEPT AS SET FORTH ABOVE, MEASUREMENTS INTERNATIONAL LIMITED WILL NOT BE RESPONSIBLE FOR ANY INCIDENTAL OR CONSEQUENTAL DAMAGES.

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# SECTION 1

# INTRODUCTION

## 1.1 SCOPE

This manual contains operating information on the Model 4220A GPIB-Controllable Matrix Scanner.

## 1.2 GENERAL DESCRIPTION

The Model 4220A Automated Matrix Scanner was engineered to provide an easy means of measuring groups of resistors without the need to continually change leads. It can also be used to scan various voltages references in back to back or nominal value measurements. The Matrix Scanner can be operated via front panel control or the GPIB interface bus.

Special care has been taken to minimize thermal emfs and improved insulation resistance characteristics. The switching mechanisms used are low-thermal two-coil latching-relays requiring a pulse of only a few milliseconds to energize or de-energize the relay. Several protection circuits are used to ensure that only one set of relays (C and P) is selected at any one time.

## 1.3 SPECIFICATIONS

### SPECIFICATIONS

**Number of Inputs:**

10 for Model 4210A
20 for Model 4220A

**Thermoelectric Potentials:**

100 nanovolts max.
Typically 10-30 nanovolts.

**Control:**

Front panel switches or IEEE-488 bus.

**Bus Input:**

24 pin IEEE-488 connector.

**Warranty**

1 year.

**Insulation Resistance:**

) $10^{11}$ ohms
Typically $10^{12}$ ohms

**Relay Contact Ratings:**

Max. Switching Power
60 W, 125 VA

**Max. Switching Voltage**
220 V DC, 250 V AC

**Max. Switching Current**
2 A AC, DC

**Max. Carrying Current**
4 A AC, DC

**Contact Resistance**
(0.05 ohms

**Expected Life**
Mechanical $10^{8}$
Electrical
2A 30 VDC $5 \times 10^{5}$

**GENERAL**

**Size in Inches (Millimeters):**

5.25" (133) high, 17.7" (451) wide, 12.0" (306) deep
(Model 4220A, 10" (255) high)

**Power:** 115/230 V +/- 10%
50/60 Hz

**Rear Panel Connections**

Low thermal tellurium copper binding posts.

**Switch Outputs:**

Four low thermal tellurium copper binding posts

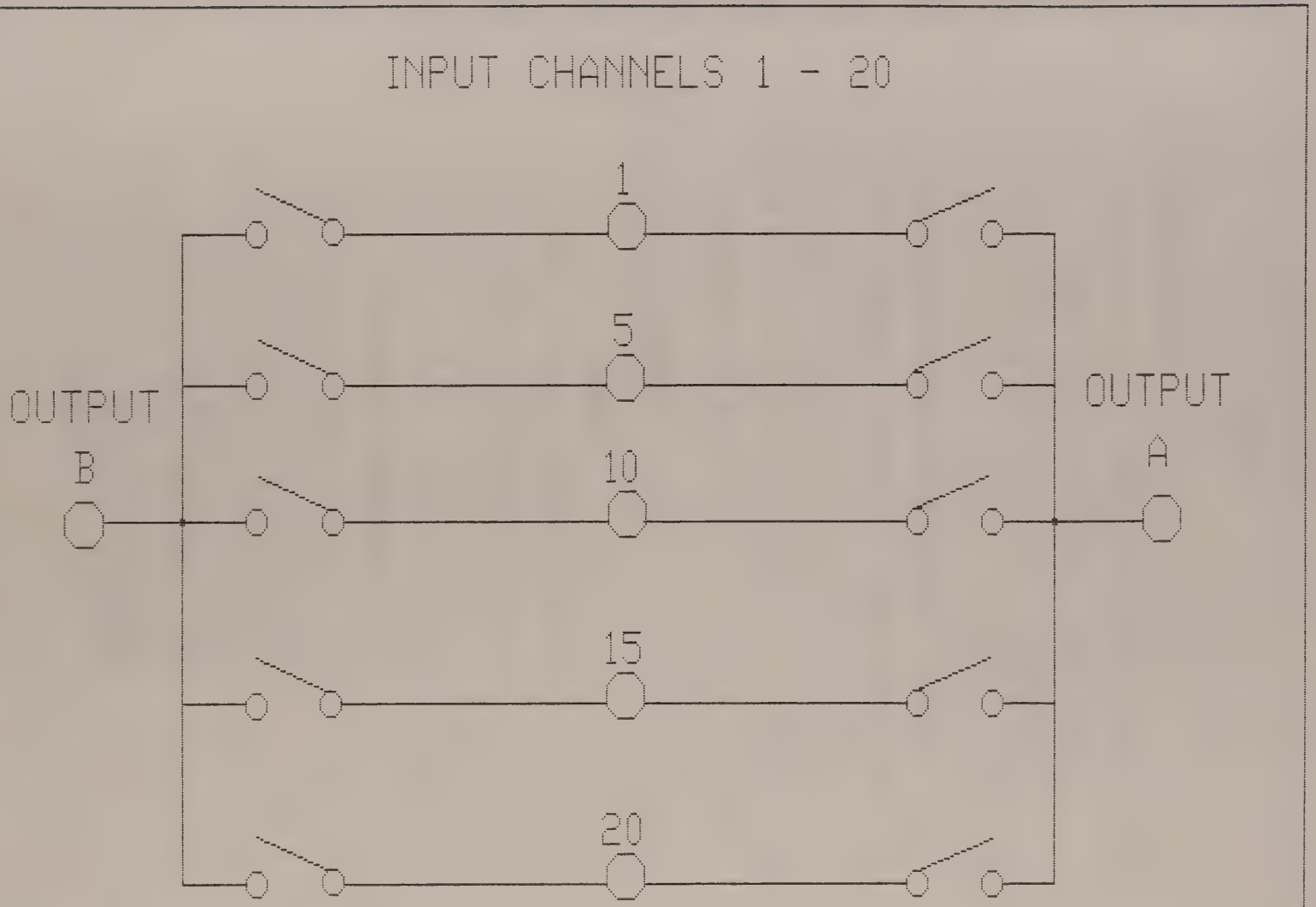



Figure 1.1 4220A BLOCK DIAGRAM

SECTION 2

## 2.1 INITIAL INSPECTION

Your new Model 4210A (4220A) was thoroughly tested and inspected before shipment. You should, however, inspect the shipping case. It should be free of any dents or mars upon receipt. The shipping case should be kept until the instrument can be thoroughly checked for mechanical and electrical damage. Please refer to the warranty card at the front of this manual should any damage or deficiencies be found.

## 2.2 ELECTRICAL INSPECTION

### Warning

The following general safety precautions should be adhered to when using this instrument:

### Ground the Instrument.

**Always ensure that the instrument chassis and cabinet are connected to an electrical ground. The instrument is supplied with a 3-conductor AC cord which plugs into the AC power module at the rear of the instrument. To minimize shock hazard always ensure that this cable is plugged into an approved three-contact electrical outlet.**

### 2.2.1 Power Requirements

The Model 4210A (4220A) requires a power supply of 100 V, 120 V, 220 V or 240 V, 47 to 63 Hz. Maximum power consumption is 25 VA.

### 2.2.2 Line Voltage Selection

The Model 4210A (4220A) is equipped with an approved International Electrotechnical Commission (IEC) power cord, power entry module and power supply. Line voltage selection is designated and switchable on the power entry module (100 V, 120 V, 220 V or 240 V).

### 2.2.3 Fuse Replacement

The fuse is located inside the power entry module. Access is obtained by removing the cover of the power entry module.

**NOTE: Always ensure that the power line cord has been removed from the electrical outlet before attempting to change the fuse.**

Fuse value for 110/120 - 1A
220/240 - 0.5A

## 2.3 ENVIORMENTAL REQUIREMENTS

In order to meet and maintain the specifications listed in Section 1 the unit should be operated in a stable environment of 23°C ± 3°C at 50% ± 10% relative humidity.

## 2.4 INITIAL OPERATION

### 2.4.1 Installation

The Model 4210A (4220A) is supplied in a standard 19" case allowing the unit to be either bench mounted or rack mounted. It comes supplied with an approved six-foot three-conductor AC power cable.

## 2.5 CONNECTIONS

### 2.5.1 Rear Panel (Fig 2.1)

Resistor connections to your Model 4210A (4220A) are made at the rear of the instrument. These connections consist of 40 (80) low-thermal binding posts designated $C_1$ and $C_2$ for current inputs and $P_1$ and $P_2$ for potential inputs in columns designated "1" through "10" ("20"). 5 (4220A), 4 (4210A) shield terminals are provided for connecting the shields of the input cables. A rear panel cover is also provided for shielding the input connections from thermals.

NOTE: The shield terminals are floating and can be be tied down to ground or driven at users discretion.

### 2.5.2 A and B OUTPUT (Fig 2.1)

Connections to the measuring apparatus are also made via the rear panel terminals designated "A" "C1" and "C2" (current) and "P1" and "P2" (potential) and "B" "C1" and "C2" for current and

"P1" and "P2" for potential. Shield terminals are provided which allows the shields of the cables to be driven.

## 2.6 FRONT PANEL CONTROLS AND INDICATORS

### 2.6.1 Power

This button applies AC Power to the Model 4210A (4220A). On power up all input channels are automatically cleared, i.e., all LEDS are out.

### 2.6.2 Channel Select

In front panel operation numbered inputs designated "C1, C2, P1, P2" 1 through 20 are connected to either the "A" or "B" "C1, C2, P1, P2" terminals by pressing any one of the front panel buttons designated 0 through 9 or combination up to 20. However, the relays will not be activated until either the "A" button or the "B" buttons are depressed.

### 2.6.3 A or B Buttons

Pressing either of these buttons after a desired channel number (numerical buttons) have been selected will automatically clear the previously set channels and then set the newly selected channel and also turn on the appropriate light.

Pressing the A or B buttons before selecting a desired channel via numerical buttons is an invalid entry and is ignored.

2.6.4 **A.B Lockout** (Rear Panel)

**NOTE: Should the same channel be selected for both sides then an error is indicated by the flashing "Remote" led. The error condition can be cleared by depressing the "Remote" button which will clear the flashing indication.**

Should a condition exist where it was necessary to select the same channel on both sides then position 8 of the Address Switch located on the rear panel can be turned off. However it is necessary to reboot the instrument by turning the Power of the instrument off and on again.

2.6.5 **Clear Button**

Pressing the "CLEAR" button will cause any previously selected channels on both the A and B sides to be cleared.

2.6.6 **A and B Channel indicators**

Front panel leds are used to indicate the channel selected. The led indicators are driven by a fourth contact on the relay to insure that the relay is operational and that the input has been connected to the output terminals.

## 2.7 INTERFACE CONNECTIONS

The Model 4210A (4220A) is compatible with the IEEE-488-1978 standard. Interface connection is made via the 24-pin connector located on the rear panel.

### 2.7.1 Address Switch

The address of the Model 4210A (4220A) is determined by the setting of the address select switch located on the rear of the instrument. The switches, designated 1, 2, 4, 8 and 16 are read at power-on or whenever a GPIB "CLEAR" message is received over the bus.

The Model 4210A (4220A) leaves the factory with the address switch set to decimal code "3".

#### 2.7.1.1 A,B Lockout

Position #8 on the Address switch has been reserved to protect the same channel from being selected on both sides and is normally used for test purposes only. When selecting "1A" and then "1B" an error is indicated by the REMOTE led flashing. The error is cleared by pressing the REMOTE led and re-selecting the proper channel.

### 2.7.2 Remote Programming

There are two functions of the 4210A (4220A) which are remotely programmable - clearing all channels and selecting a specific channel.

### 2.7.3 Command Set (via GPIB)

To select a specific channel send a character string consisting of the channel number from 1 to 20 and A or B. To select channel 1 on the A side

send a "1A", to select channel 14 on the B side · send a "14B", etc.

The character string must be terminated by a non numeric character such as a carriage return (ASCII "13") or space (ASCII"32"), many controllers automatically append a carriage return, line feed to strings when they are sent. If your controller does not, send the channel string followed by a space, eg "16 32 ".

**Clearing All Channels**

To clear all channels send the character "*" via the bus.

### 2.7.4 Remote

Any character received via the bus (even if invalid) sets the "Remote" LED on. Remote remains on until the **REMOTE** key is pressed or a GPIB CLEAR is sent over the bus. While Remote is on the front panel input select keys are ignored.

**NOTE;** The REMOTE led will flash the same channel on both A Channel and B Channel is addressed. Pressing the REMOTE button will clear this condition and leave the unit in the remote mode.

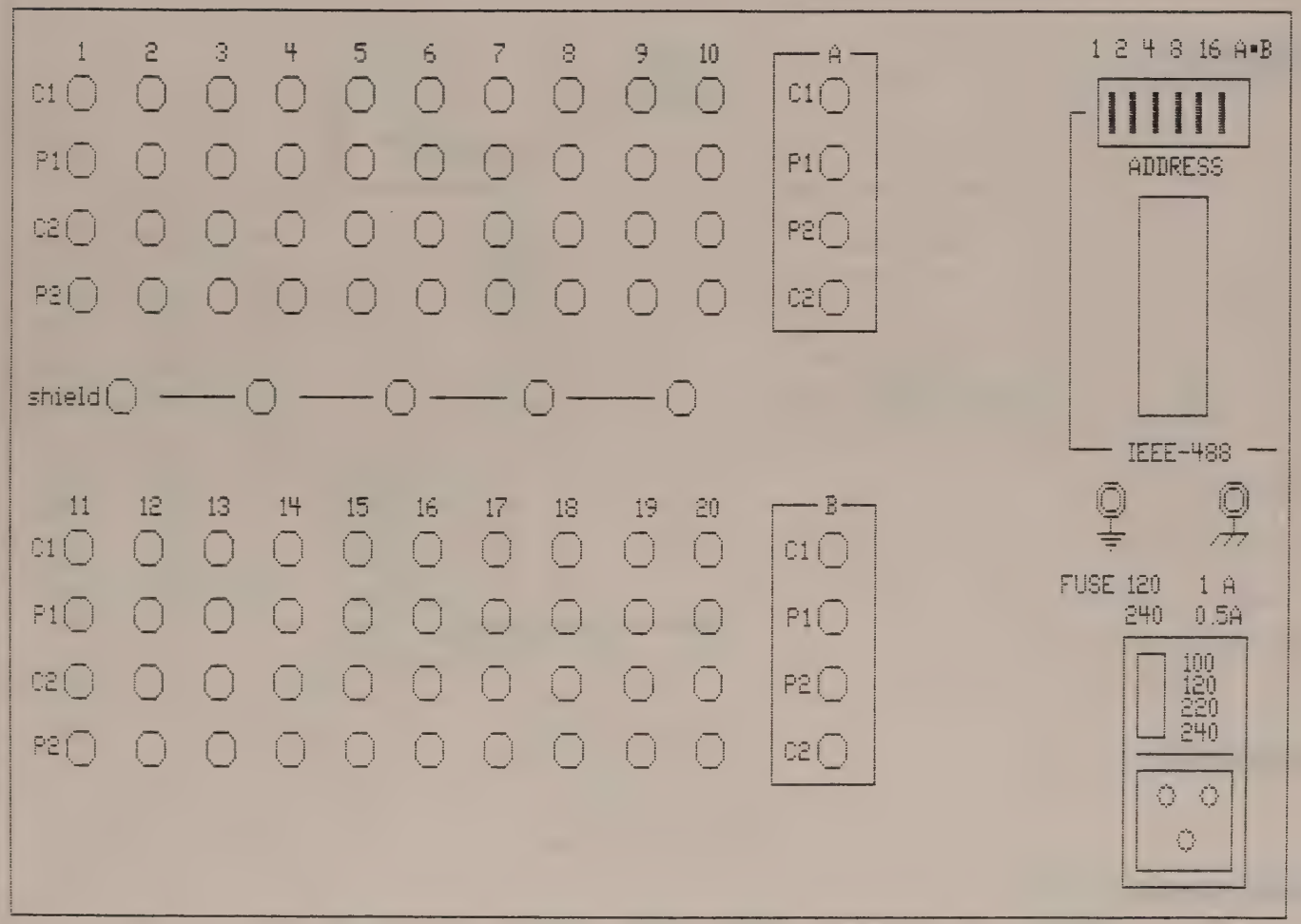
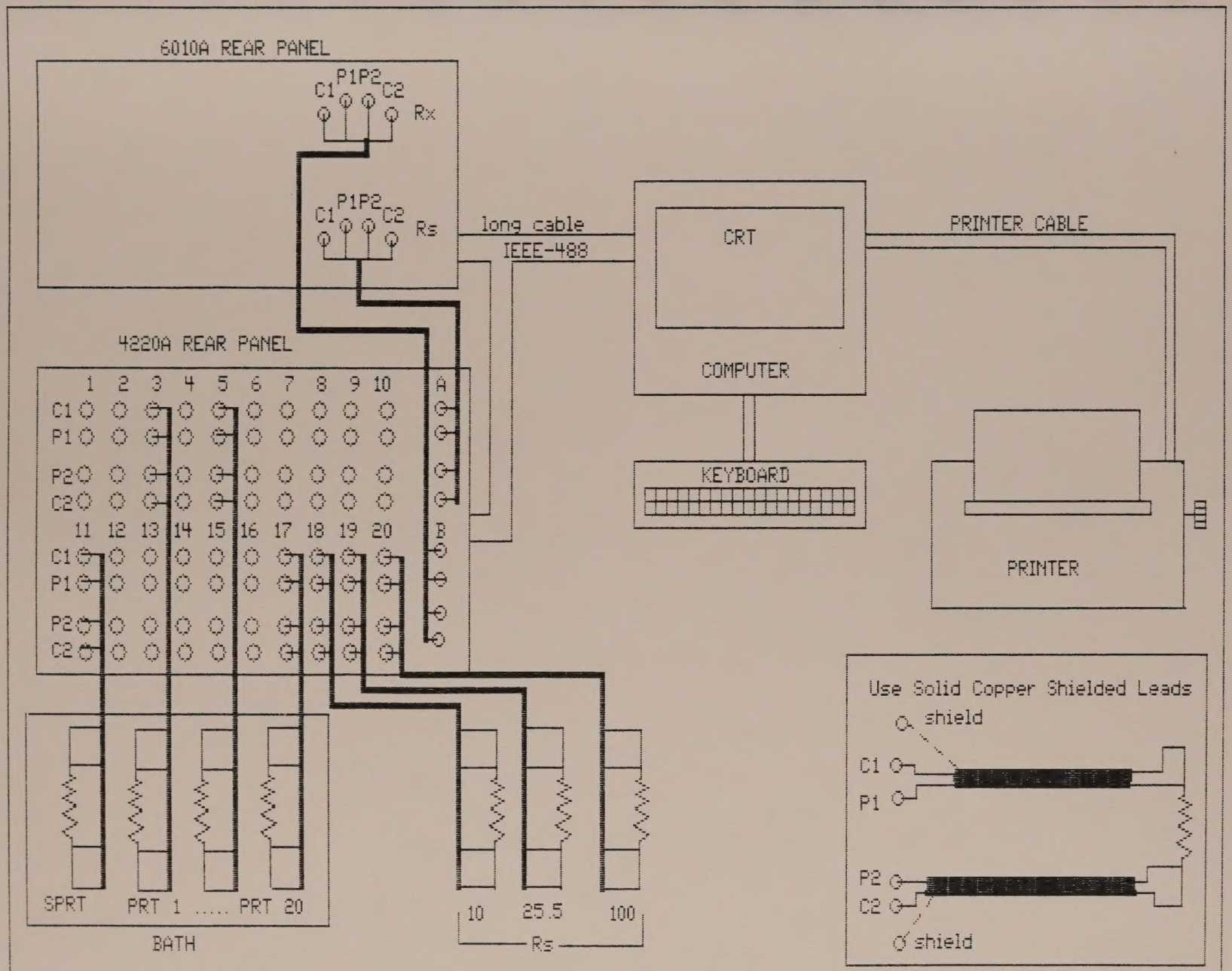
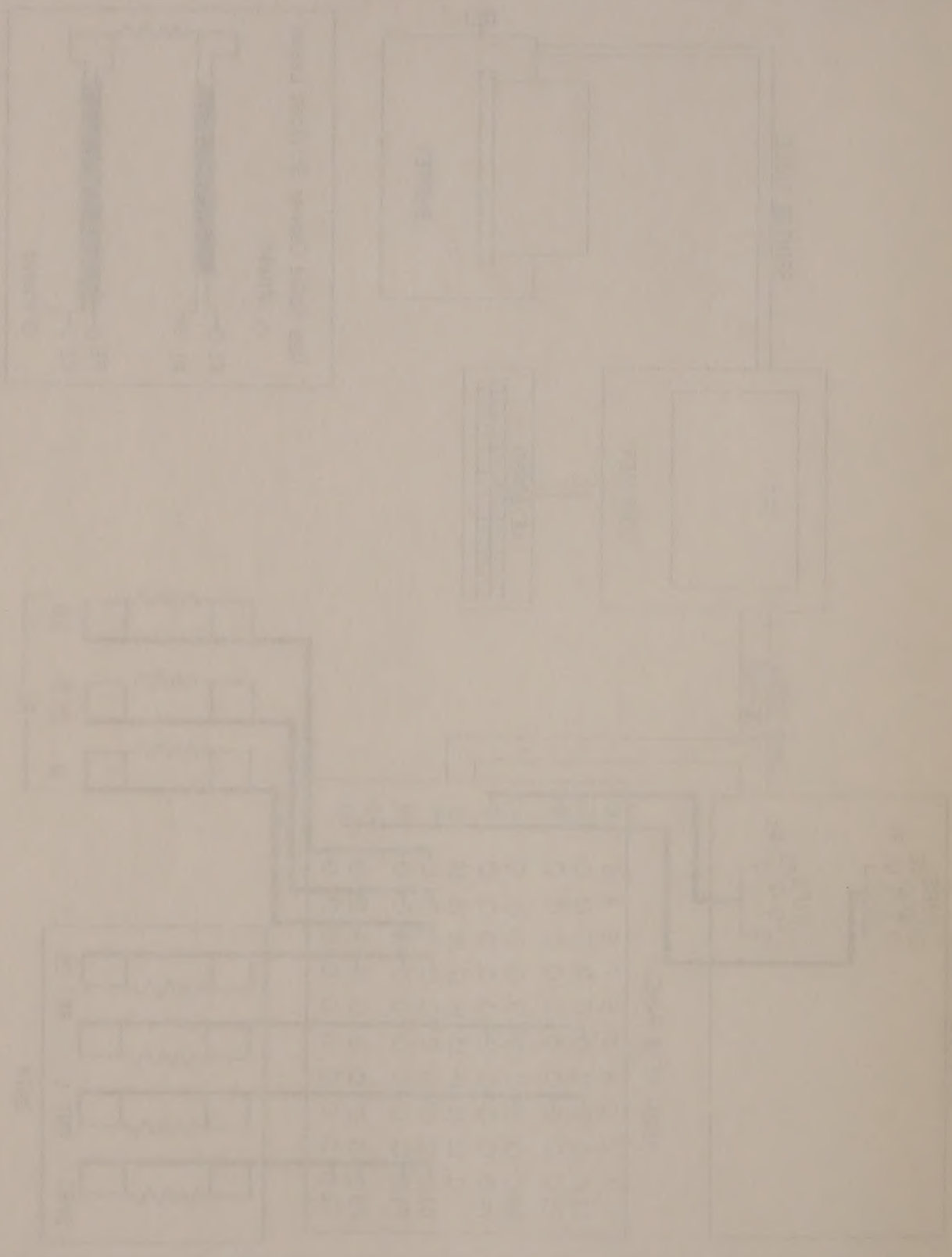



Figure 2.1

4220A REAR PANEL CONNECTIONS




# MODEL 6010A/4220A SYSTEM INTERCONNECTIONS



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